

## Supplementary Information | S1 (Box)

### Whisker follicle development and innervation

The whisker follicles are specialized hair follicles arranged into a grid of five curvilinear rows (A–E in FIG. 1) with constant numbers of follicles in each row ranging from four to seven. The dorsal two rows (A, B) emerge from the lateral nasal prominence, while the three ventral rows (C–E) develop from the maxillary prominence<sup>1–3</sup>. In mice, the vibrissa follicle buds are seen by embryonic day (E)12 and smaller labial hair follicles appear a day later<sup>3</sup>.

Trigeminal axons form morphologically distinct endings and innervate a variety of sensory receptors inside the follicular sinus complex (FSC)<sup>4,5</sup>. The superficial vibrissal nerves (SVNs) supply the Merkel cells in the ridge collar and the transverse lanceolate endings in the inner conical body of the FSC. The deep vibrissal nerves (DVNs) supply the longitudinal lanceolate endings, Merkel cells endings in the outer root sheath, the reticular endings, and the Ruffini corpuscles<sup>4,5</sup>. Advillin, an actin-binding protein, is highly expressed by the trigeminal ganglion (TG) cells. One study<sup>6</sup> took advantage of this expression pattern and replaced the start codon of the *Advillin* gene with the gene encoding human placenta alkaline phosphatase (Avil-hPLAP). This allowed for detailed examination of the innervation of the developing mouse whisker pad in knock-in heterozygous Avil-hPLAP mice with alkaline phosphatase staining. This showed that the earliest arriving trigeminal axons are those that contribute to the DVN. They initially form a plexus underneath the emerging whisker follicle buds at E12.5. Intervibrissal nerves which innervate the skin between the follicles arrive by E14.5. SVN axons arrive much later around the time of the birth.

The organization and the number of mystacial and labial hair follicles in the developing snout is a necessary template for the patterning of neural elements in the brain that process whisker-specific information. Indeed, the number and spatial layout of peripheral whiskers is instructive in determining whisker-related neural patterns at the central level as it has been demonstrated by whisker follicle or infraorbital nerve lesions in neonatal rodents and in mice bred for, or with, artificially induced, aberrant numbers of whiskers<sup>7–12</sup>.

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